

- 23 -

CLAIMS

1. Pneumatic tire (1) comprising a carcass structure (2) having at least one carcass ply (2a), and at least one annular reinforcing structure (3) associated to said carcass ply (2a), a tread band (6) made of an elastomeric material at a radially outer position with respect to said carcass structure (2), a belt structure (5) interposed between said carcass structure (2) and said tread band (6) and a pair of axially opposite side walls (7, 8) on said carcass structure (2),

wherein the tread band (6) comprises:

i) at least one first sector (9), radially extending, substantially consisting of a first elastomeric material;

ii) a plurality of second sectors (10), radially extending, positioned at axially opposite sides of said at least one first sector (9) and substantially consisting of a second elastomeric material;

iii) at least one longitudinal groove (11) formed in said at least one first sector (9) and extending substantially for the entire circumferential development of the tread band (6);

wherein said first elastomeric material has a modulus of elasticity (E') under compression at 23°C greater than the modulus of elasticity (E') under compression at 23°C of said second elastomeric material, and

wherein the modulus of elasticity (E') under compression at 23°C of said first elastomeric material is comprised between about 20 and about 80 MPa.

2. Pneumatic tire (1) according to claim 1, wherein the modulus of elasticity (E') under compression at 23°C of said second elastomeric material is comprised between about 4 and about 15 MPa.

3. Pneumatic tire (1) according to claim 1 or 2, wherein the ratio between the modulus of elasticity (E') under compression at 23°C of the first elastomeric material and the modulus of elasticity (E') under compression at 23°C of the second elastomeric material of the tread band is not lower than about 1.30.

4. Pneumatic tire (1) according to claim 3, wherein the ratio between the modulus of elasticity (E') under compression at 23°C of the first elastomeric material and the modulus of elasticity (E') under compression at 23°C of the second elastomeric material

- 24 -

is comprised between about 1.5 and about 20.

5 5. Pneumatic tire (1) according to claim 4, wherein the ratio between the modulus of elasticity (E') under compression at 23°C of the first elastomeric material and the modulus of elasticity (E') under compression at 23°C of the second elastomeric material is comprised between about 2.3 and about 7.

6. Pneumatic tire (1) according to claim 1, wherein the IRHD hardness at 23°C of the first elastomeric material, measured according to standard ISO 48, is comprised between about 75 and about 95.

10 7. Pneumatic tire (1) according to claim 1, wherein the IRHD hardness at 23°C of the second elastomeric material, measured according to standard ISO 48, is comprised between about 35 and about 80.

15 8. Pneumatic tire (1) according to claims 6 and 7, wherein the ratio between the IRHD hardness at 23°C of the first elastomeric material, measured according to standard ISO 48, and the IRHD hardness at 23°C of the second elastomeric material, measured according to standard ISO 48, is not lower than about 1.10.

9. Pneumatic tire (1) according to claim 8, wherein the ratio between the IRHD hardness at 23°C of the first elastomeric material, measured according to standard ISO 48, and the IRHD hardness at 23°C of the second elastomeric material, measured according to standard ISO 48, is comprised between about 1.15 and about 2.70.

20 10. Pneumatic tire (1) according to claim 1, wherein the tread band (6) is provided with a plurality of longitudinal grooves (11) and wherein said grooves (11) are formed in respective first sectors (9), radially extending and axially spaced apart, substantially consisting of said first elastomeric material.

25 11. Pneumatic tire (1) according to claim 1 or 10, wherein said at least one first sector (9) is radially extending substantially for the entire thickness of the tread band (6).

12. Pneumatic tire (1) according to claim 1 or 10, wherein an additional layer (12) of elastomeric material is interposed between said tread band (6) and said belt structure (5).

30 13. Pneumatic tire (1) according to claim 12, wherein said layer (12) is substantially consisting of said first elastomeric material.

14. Pneumatic tire (1) according to claim 12, wherein said layer (12) is substantially

- 25 -

consisting of said second elastomeric material.

15. Pneumatic tire (1) according to claim 12, wherein said layer (12) has a thickness comprised between 1 and 5 mm.

16. Pneumatic tire (1) according to claim 1 or 10, wherein the width of said at least one first sector (9) is at least equal to the width of said at least one longitudinal groove (11).

17. Pneumatic tire (1) according to claim 16, wherein the difference between the width of said at least one first sector (9) and the width of said at least one longitudinal groove (11) is comprised between 4 and 10 mm.

18. Pneumatic tire (1) according to claim 1 or 10, wherein said at least one longitudinal groove (11) is positioned astride the median plane (m) of said at least one first sector (9).

19. Process for building a pneumatic tire (1) comprising the steps of:

a) building a carcass structure (2) having at least one carcass ply (2a) associated to at least one annular reinforcing structure (3);

b) assembling a belt structure (5);

c) arranging, at a radially outer position with respect to said belt structure (5), at least one radially extending first sector (9) of a tread band (6), substantially consisting of a first elastomeric material having, after vulcanization, a value of the modulus of elasticity (E') under compression at 23°C comprised between about 20 and about 80 MPa;

d) arranging, at a radially outer position with respect to said belt structure (5), a plurality of radially extending second sectors (10) of the tread band (6), axially spaced apart and substantially consisting of a second elastomeric material having, after vulcanization, a value of the modulus of elasticity (E') under compression at 23°C lower than the value of the modulus of elasticity (E') under compression at 23°C of said first elastomeric material;

wherein said steps c) and d) are carried out in such a way that said second sectors (10) are positioned at axially opposite sides of said at least one first sector (9).

20. Process according to claim 19, wherein said belt structure (5) is shaped on a substantially cylindrical auxiliary drum (18') and wherein said steps c) and d) comprise

- 26 -

the steps of:

- e) positioning said auxiliary drum (18') at a first delivery member (22) of the first elastomeric material;
 - f) delivering by means of said first delivery member (22) at least one elongated element (24) made of said first elastomeric material at a radially outer position with respect to said belt structure (5) while carrying out a relative displacement between the first delivery member (22) and the auxiliary drum (18'), so as to form said at least one first sector (9) of the tread band (6);
 - g) positioning the auxiliary drum (18') at a second delivery member (25) of the second elastomeric material;
 - h) delivering by means of said second delivery member (25) at least one elongated element (27) made of said second elastomeric material at a radially outer position with respect to said belt structure (5) while carrying out a relative displacement between the second delivery member (25) and the auxiliary drum (18'), so as to form said second sectors (10) of the tread band (6) axially spaced apart and positioned at opposite sides of said at least one first sector (9).
21. Process according to claim 20, wherein said steps f) and h) of delivering the elongated elements (24, 27) of said first and second elastomeric materials are carried out by rotating said auxiliary drum (18') about its rotation axis (X-X).
22. Process according to claim 20 or 21, wherein the relative displacement between the delivery member (22, 25) and the auxiliary drum (18') is carried out by imparting to the auxiliary drum (18') a first translational movement along a direction substantially parallel to its rotation axis (X-X) and/or a second translational movement along a direction substantially perpendicular to said axis (X-X).
23. Process according to claim 20, wherein said steps f) and h) of delivering the elongated elements of said first and second elastomeric materials are carried out by forming a plurality of coils axially arranged side-by-side and/or radially superposed to define said at least one first (9) and said second (10) sectors of the tread band (6).
24. Process according to claim 19, wherein said belt structure (5) is assembled on a substantially toroidal support (18, 28) and wherein said steps c) and d) comprise the steps of:
- e') positioning said substantially toroidal support (18, 28) at a first delivery member (22,

- 27 -

32) of the first elastomeric material;

f') delivering by means of said first delivery member (22, 32) at least one elongated element made of said first elastomeric material at a radially outer position with respect to said belt structure (5) while carrying out a relative displacement between the first
5 delivery member (22, 32) and the substantially toroidal support (18, 28), so as to form said at least one first sector (9) of the tread band (6);

g') positioning the substantially toroidal support (18, 28) at a second delivery member (25, 34) of the second elastomeric material;

h') delivering by means of said second delivery member (25, 34) at least one elongated
10 element made of said second elastomeric material at a radially outer position with respect to said belt structure (5) while carrying out a relative displacement between the second delivery member (25, 34) and the substantially toroidal support (18, 28), so as to form said second sectors (10) of tread band (6) axially spaced apart and positioned at axially opposite sides of said at least one first sector (9).

15 25. Process according to claim 24, wherein said steps f') and h') of delivering the elongated elements of said first and second elastomeric materials are carried out by rotating said substantially toroidal support (18, 28) about its rotation axis (X-X).

20 26. Process according to claim 24 or 25, wherein the relative displacement between the delivery member (32, 34) and the substantially toroidal support (18, 28) is carried out by imparting to the substantially toroidal support (18, 28) a first translational movement along a direction substantially parallel to its rotation axis (X-X) and/or a second translational movement along a direction substantially perpendicular to said axis (X-X).

25 27. Process according to claim 24, wherein said steps f') and h') of delivering the elongated elements of said first and second elastomeric materials are carried out by forming a plurality of coils axially arranged side-by-side and/or radially superposed to define said at least one first (9) and said second (10) sectors of the tread band (6).

28. Process according to claim 24, wherein said substantially toroidal support (28) is substantially rigid.

30 29. Process according to any one of claims 19 to 28, further comprising the step of delivering, at a radially outer position with respect to said belt structure (5), at least one additional layer (12) of elastomeric material before carrying out said step c) of delivering said at least one first sector (9).

- 28 -

30. Process according to any one of claims 19 to 28, further comprising the step of delivering, at a radially outer position with respect to said belt structure (5), at least one additional layer (12) of elastomeric material simultaneously with said step c) of delivering said at least one first sector (9).
- 5 31. Process according to any one of claims 19 to 28, further comprising the step of delivering, at a radially outer position with respect to said belt structure (5), at least one additional layer (12) of elastomeric material before carrying out said step d) of delivering said plurality of second sectors (10).
- 10 32. Process according to any one of claims 19 to 28, further comprising the step of delivering, at a radially outer position with respect to said belt structure (5), at least one additional layer (12) of elastomeric material simultaneously with said step d) of delivering said plurality of second sectors (10).
33. Process according to any one of claims 29 to 32, wherein said layer (12) is substantially consisting of said first elastomeric material.
- 15 34. Process according to any one of claims 29 to 32, wherein said layer (12) is substantially consisting of said second elastomeric material.